

Wisconsin Urban & Community Forests

A Quarterly Newsletter of the Wisconsin Department of Natural Resources, Forestry Division

Three Years with EAB – West Bend’s Story

by Mike Jentsch
 City of West Bend Park & Forestry Superintendent
 and Olivia Witthun
 DNR Division of Forestry

The city of West Bend is in Washington County, about a 30-minute drive north of Milwaukee. More than 32,000 people call West Bend home. Emerald ash borer was first confirmed in West Bend on June 9, 2010. The city has been dealing with this invasive insect for over three years. Here is their story.

Surveying

After EAB was first detected in downtown West Bend, 155 other ash trees in the immediate vicinity were climbed and surveyed. A few hundred others were surveyed from the ground or from a bucket truck. After all the effort, only 10 downtown ash trees were found to be infested. For the most part, the surveyed trees looked like your standard ash, exhibiting no unusual symptoms of decline.

West Bend’s arborists incorporated simple surveying into their daily routine. Suspicious portions of ash

trees were peeled. No additional infested ash were found until June 2011. The one sign they keyed in on was bark flecking from woodpeckers. Again, the canopies looked like those of typical ash, but with just a bit of woodpecker damage.

City arborists also conducted walking and windshield surveys around known infestation areas. Canopies of questionable trees were inspected using a bucket truck. In the fall of 2011, 17 more infested trees were located downtown. The number-one indicator—WOODPECKER DAMAGE! Currently, the city waits until all the leaves are off the trees and surveys for woodpecker flecking. Because West Bend is fairly well infested, any ash exhibiting woodpecker damage is automatically marked for removal. Staff periodically peel infested trees to help determine the age and degree of infestations in particular areas.

West Bend typically inspects privately owned ash trees only if a report falls outside the city’s known infested areas. This gives the city a firm grasp on where the heaviest part of the infestations is and helps to plan ash management actions accordingly.

West Bend’s experience confirms what we’ve always heard. Any ash tree of any size is susceptible. Green or white, it doesn’t matter. Healthy or stressed, it doesn’t matter. Trees ranging from 8 to 44 inches in diameter have been removed. Street trees, non-street trees and parking lot trees have all been infested. EAB galleries have been found in 1"-diameter limbs as well as in the trunk at ground level. EAB seems to just pick a tree and go at it.

EAB Plan

West Bend has no formal, in-depth EAB plan. Instead, they find it more useful to work off short-term operational plans. This approach works well because of fluctuations in their EAB situation and



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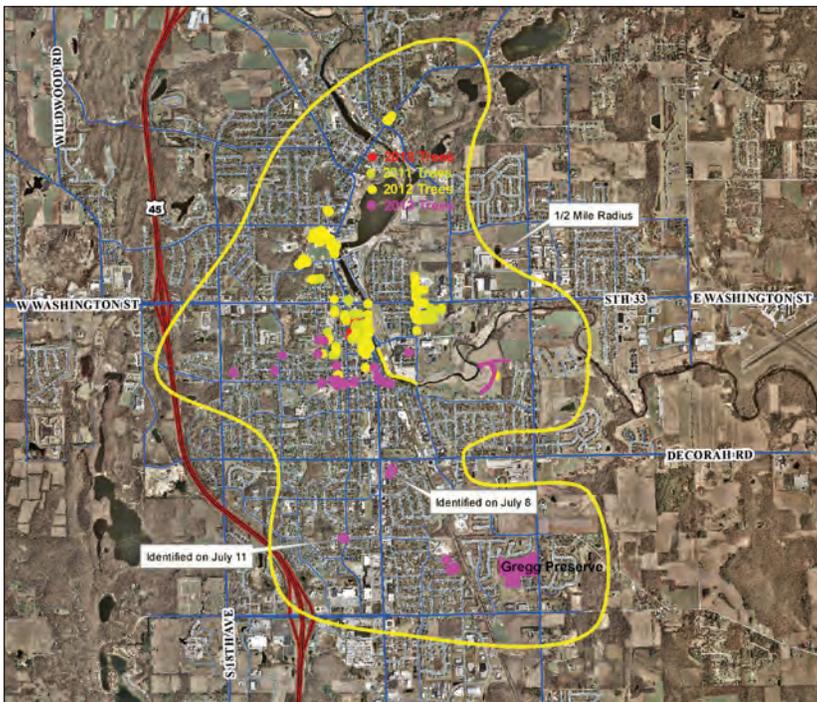
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This current infestation map of West Bend shows how EAB has spread over the years. Note: The yellow line denotes a half-mile radius around the infestation.

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<http://dnr.wi.gov/forestry/UF/>

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**Community Profile:**

Population: 13,187
Public trees: 5,586
Number of parks: 9

Program Profile:

Tree City USA: 3 years

Staff:

1 public works director
Public
8 fulltime staff

Equipment:

50' bucket truck
dump trucks

Community Profile

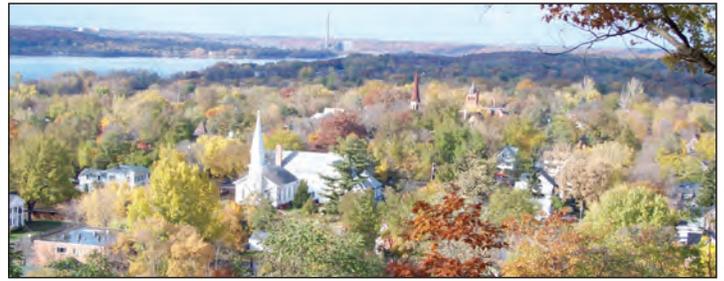
Hudson and Its Trees: A Tradition Worth Preserving

by Meg Heaton
Hudson Star Observer

Trees have been an important part of life in Hudson dating back to its earliest days in the mid-1800s. Hudson sits in the heart of the St. Croix Valley, which back then contained the largest white pine forest in the world. While the large timber and the industry associated with it may have disappeared, the community maintains a commitment to their urban forest, a commitment demonstrated by Hudson's Tree City USA designation for the past three years.

Tom Zeuli is Hudson's director of parks and public works. Working with Wisconsin DNR forester Cindy Casey, Zeuli attended the DNR's Community Tree Management Institute back in 2009 that "turned on the light switch" and led to Hudson's first urban forestry program. "A city our size needed a program," said Zeuli. Hudson has a population of more than 13,000.

Since that time, Zeuli, City Councilman John Hoggatt and a committed group of volunteers who make up the Urban Forestry Board have worked diligently to not only preserve Hudson's trees but to establish a management plan that will keep them healthy and thriving for generations to come. The program has received significant assistance from DNR Urban Forestry grants.



City of Hudson

This view from Prospect Park, one of nine in the city of Hudson, highlights the priority a healthy urban forest has in the community.

The program includes several ambitious elements, including the 2011 comprehensive inventory of public street and park trees. The inventory provides valuable information about the diversity of trees in Hudson, their condition and a multi-year budget to support the program.

Significant information from the inventory included that, of the 40 different types of trees in Hudson's urban forest, 25 percent of them are ash trees with another 26 percent being maples. That finding, par-

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Photo: City of Hudson

Members of the Hudson Urban Forestry Board didn't let a little rain stop them from adding to the city's forest at the 2011 festivities.



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Articles, news items, photos and ideas are welcome.

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For breaking UF news, anecdotes, announcements and networking opportunities, sign up for The Urban Forestry Insider, DNR's e-bulletin. Archives are at dnr.wi.gov, keyword "Insider."

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Project Profile

Small Community, Big Gravel Planting Beds

by Rex Zenke, Forester
Village of Rothschild

The village of Rothschild is small community (population 5,000) that neighbors Wausau. With decreasing budgets over the last few years, the village has been trying to find ways to cut costs yet maintain the number of trees they plant. It has been the village's goal to plant trees along a street that was reconstructed the previous year. This usually totals 50 to 75 trees. In 2013, along with budgeted money, the village received planting funds from Wisconsin Public Service. To get the biggest bang for its buck the village decided to purchase mostly bare root trees. With limited staff and time during spring, planting the increased number of trees posed a huge problem. The village forester was concerned that the trees could not all be planted before a large number of them would perish. To reduce costs and increase the tree planting window, the village stored the 120, 1½" bare root trees of five different species and 35 B&B trees in a gravel bed. The village forester had heard about a tree holding system called the *Missouri Gravel Bed* at a presentation at the Wisconsin urban forestry conference in 2012. The village used gravel-bed information from the University of Missouri as well as the University of Minnesota.

Location

Rothschild's MGB was located on the north side of a 35- by 60-foot metal pole building and was fenced. This area provided shade to help the young trees stay out of the direct sunlight as the spring days began to heat up. It also had natural drainage that allowed the water from roof runoff and the water added through irrigation to slowly drain away. This prevented the bare root trees from standing in water for too long.

Building the Beds and Adding the Trees

With most of the grass and weeds removed, the village placed plastic on the ground to prevent grass and weeds from growing into the gravel. Then a thin layer (2 to 3 inches on the edge and deeper in the center) of gravel was added to level the area. The gravel was 3/8-inch fractured chip stone that previously had been used on village streets for chip sealing. When a village street is chip sealed, the 3/8-inch fractured stone remains on the road for a couple of weeks, then the excess is removed with a street sweeper. Since the material was only on the road surface for a few weeks, the amount of contamination and debris was minimal. In addition, the material had remained piled since the previous summer which allowed for winter snow and spring rain to wash the pile. This excess material



Fibrous Roots

Photo: Village of Rothschild

worked very well as it was easy to handle, had enough fine material in it to hold moisture, yet it was not difficult to remove the trees later. A small-diameter pea gravel material would also work well. With the bed prepared, the trees were placed directly from the truck onto the gravel bed, spaced as close together as their roots allowed. As 5 to 10 trees were placed, the same gravel material was added over the roots. Enough gravel was added to completely cover the roots to a depth of 1 to 2 inches. The MGB was 15 feet wide and 45 feet long when completed. The entire area was then watered. The trees were now waiting for planting. The village would then back a trailer next to the trees and gently remove the tree by pulling and place it on the trailer. This allowed the village to load a smaller number of trees based on the weather and amount of available time that day.

Irrigation System

To minimize the time to water all the trees, the village installed an irrigation system. This simple system consisted of:

- 🌱 (2) 50-foot garden hoses
- 🌱 (7) 10-foot plastic PVC pipes, 1 inch in diameter
- 🌱 (5) 1-inch plastic PVC tees
- 🌱 (2) plastic PVC 90-degree elbows
- 🌱 (5) pop-up fan irrigation-type heads
- 🌱 (1) irrigation timer that connects to the faucet

The irrigation timer was connected to an outdoor faucet, allowing the system to be programmed to water for 10 minutes every 6 hours. The hose then was connected from the timer to the PVC pipe.

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West Bend's Story, continued from page 1

response. They couldn't do this without a dedicated city forester with a firm grasp on West Bend's management objectives as well as skilled city arborists.

Removals

Removals are done in-house by skilled climbers with all the essential equipment. West Bend is not currently conducting large-scale, preemptive ash removal,



Photo: City of West Bend

West Bend's forestry equipment in action. The loader grapple greatly improved efficiencies during tree removals.

Background

- 12,370 total street trees (2011)
- 3,036 ash street trees, 25% street tree inventory (2011)
- West Bend's Forestry Division is housed within the Parks, Recreation & Forestry Department and is responsible for the maintenance of all street and park trees
- 2012 forestry budget \$711,000 (includes labor, equipment & materials)
- Capital outlay budget funds EAB management through a 15-year loan to the city
- Several years ago West Bend changed their official city tree from a white ash to a Freeman maple

but they are a bit more aggressive in ash removal decisions. For example, if three ash are obviously infested in a line of five, all five trees are removed.

West Bend has a long-standing partnership with WE Energies. The utility will begin topping out infested ash under power lines this winter and the forestry crew will complete the removals and dispose of the brush and wood.

West Bend anticipates doubling their ash removals this year. To help with the workload increase, forestry will partner with the public works department. Forestry's two crews will concentrate on tree removals, chipping and log hauling. Public works will follow behind and conduct the clean-up, including use of a street sweeper to get the last of the debris. This partnership allows the arborists to focus only on removals, thereby increasing overall efficiency.

While removing infested ash during peak flight season (June–July), city arborists have been astonished at the number of EAB adults flying around their heads. One staffer likened it to a swarm of wasps.

UPDATE – West Bend's workload dramatically changed mid-2013, and their EAB surveys & removals were put on hold for approximately 6 months. (To save taxpayer money city forestry staff were tasked with building a bridge for the city's flagship park.) Only 75 street trees were removed during 2013. West Bend's forestry crew is back in action and believes 2014 should be a banner year.

Wood ...Debris

The majority of West Bend's wood chips currently are used in parks and on public properties. Some are dumped at the DPW yard and offered free to residents. A local farmer also uses some for cattle bedding. As losses to EAB increase, there is concern the city may end up with an overabundance of chips. West Bend's wood chipper has been certified by Wisconsin Department of Agriculture, Trade and Consumer Protection so concern about transporting viable EAB is not an issue.

The city has 2½ years' worth of removals stored on various log piles. Infested ash logs are stored for a minimum of one year. Other species are also stored. Stacking and storing logs does create more work for staff, but is an attempt to slow the spread of EAB as much as possible. The city's first, highly successful silent auction of logs was held recently. Five log piles were available for bid either individually or as a whole. Seven bids were received. The high bid for each lot was from one individual, totaling \$4,275. Proceeds went directly back into a city fund for EAB response. Selling logs will not recoup the cost of responding to EAB, but it certainly helps.

Treatment

For three years, staff treated 89 high-value public ash trees using imidacloprid soil injection. Next year, the city will stop treating and instead refocus that money on planting a diversity of replacement trees. Residents are allowed to treat ash themselves using a soil drench. Forestry keeps track of which ash receive treatment from residents and what chemicals are used via a free application process, www.ci.west-bend.wi.us/index.php?option=com_docman&task=doc_view&gid=1489&tmpl=component&format=raw&Itemid=69.

Planting

West Bend started planting replacement trees even before they knew they had EAB. Replanting officially began in 2009 and has resulted in over 500 new trees, though only 246 ash had been removed as of 2012. West Bend plants a diversity of trees in key locations to help reduce impacts of any new invasive pest. Street tree planting is typically contracted, allowing the forestry crew to focus on other duties. Trees are all balled-&-burlapped stock.

West Bend has three planting programs in addition to their standard planting. The Free Street Tree Program lets residents request that a tree be planted on their terrace in the fall. The Planting Permit Program reimburses residents up to \$50 per tree for planting on the terrace if approved by the city forester, if planted correctly and if the planting meets city standards. Tree Surety is the third program, requiring tree planting in new developments and on road projects. The city also has a memorial tree program and a tree demonstration area where residents can see what tree species look like when mature; see www.ci.west-bend.wi.us/index.php/departments/development/44-departments/parksrecreation.



West Bend's wood storage facility and infested ash logs.

Ordinances

EAB infested ash are covered by the city's nuisance ordinance if the trees are on public property or could fall onto public property. "All trees which are a menace to public safety" must be abated. West Bend has not yet needed to enforce this ordinance on private property for EAB infested trees, but they have used it in the past for other situations.

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Public Awareness

West Bend says communication with local residents and public officials is the most important thing to do! You don't want anyone to be surprised.

- 🍃 West Bend was writing articles for their local newspaper before EAB was even found in the city.
- 🍃 The forestry division provides monthly EAB updates to city managers and elected officials, including maps and numbers.
- 🍃 The city has participated in EAB Awareness Week. Yellow ribbon was tied around ash trees in a prominent park, on a main thoroughfare, at the local hospital and on the streets where elected officials lived. The officials knew about this ahead of time but were still astonished at the number of ash in West Bend.
- 🍃 The city marks ash for removal with a large green dot which really gets the public's attention. The city gets many calls about the trees with the green dots and even prepares news articles ahead of time for the local paper.
- 🍃 West Bend's website includes an entire page devoted to EAB. General EAB information and homeowner advice can be found there. The site also includes a map showing the location of all ash street trees in West Bend; see www.ci.west-bend.wi.us/index.php/component/docman/cat_view/77-parks-recreation-forestry/133-forestry/152-emerald-ash-borer-info?Itemid=69.
- 🍃 The city's Facebook page is updated regularly and residents actively engage in forestry discussions.
- 🍃 Using informative door hangers is another way the city communicates with residents about specific terrace tree removals. The forestry crew uses one of three different versions depending on the situation.

Advice for Other Municipalities

West Bend's advice for other communities includes three things: 1) Communication with residents and public officials is the most important thing you can do; 2) Develop a relationship with your local reporter; 3) Planting a diversity of trees is your best bet against invasive pests. To see a copy of West Bend's forestry presentation to local officials, visit <http://dnr.wi.gov/topic/UrbanForests/documents/EABToolBox/WestBendPre.pdf>.

Value

(all monetary values are 2008 figures and do not include monetary values of tree benefits)

- Value of all publicly owned trees \$12.5 million
- Value of publicly owned ash \$3.3 million
- Cost to remove and replant all publicly owned ash \$2.7 million
 - ◇ Cost to remove street ash trees (includes stump grinding and reseeded) \$1.6 million
 - ◇ Cost to remove park and other maintained area ash trees (includes stump grinding and reseeded) \$180,000
 - ◇ Cost to replant street ash trees \$913,000
 - ◇ Cost to replant park and other maintained area trees \$103,000

Public Ash Tree Removals Due to EAB

- 10 – # of ash removed in 2010
- 38 – # of ash removed in 2011
- 198 – # of ash removed in 2012
- 400 – anticipated # of ash removals in 2013

Equipment

- 2 chippers (the second recently purchased)
- 2 chip trucks (the second recently added by retrofitting an old DPW plow truck)
- 1 55-foot lift
- 3 loaders with grapples
- 2 stump grinders
- additional equipment borrowed from DPW (e.g., larger log-hauling trucks)



NOTICE:

Your Ash street tree is located within an Emerald Ash Borer infestation and has been marked for removal.

Procedure:

The West Bend Park, Recreation, and Forestry Department will be removing the tree and tree stump. The infested wood will be hauled away and is not available to the property owner.

If you are interested in having the tree replaced please contact the Park, Recreation, & Forestry Department at 262-335-5080 or visit our web site at www.ci.west-bend.wi.us. Sign up for our Free Street Tree program is available from the first Monday in October thru October 31. If funding is available the City will plant the replacement tree/trees the following year.

The Emerald Ash Borer is a non-native insect that is attacking and destroying all true ash tree varieties. There are no native predators to control this insect. For additional information on the Emerald Ash Borer please visit the following web sites. Thank you.

www.ci.west-bend.wi.us

<http://datcpservices.wisconsin.gov/eab/index.jsp>

<http://www.emeraldashborer.info/>

One of the three different door hangers used for public awareness.

Emerald Ash Borer Update

by Bill McNee, Forest Health Specialist
DNR Division of Forestry

As the winter of 2014 holds on tightly, Wisconsin has had six new counties where EAB life stages have been collected, plus one county with EAB signs but no life stages, since mid-July 2013:

- ✔ Dane County – City of Madison
- ✔ Dodge County – City of Watertown
- ✔ Douglas County – City of Superior
- ✔ Fond du Lac County – Town of Fond du Lac; Kettle Moraine State Forest, at Mauthe Lake and Long Lake
- ✔ Jefferson County – City of Whitewater. Signs of EAB have been found but no life stages have been collected
- ✔ Sauk County – Mirror Lake State Park
- ✔ Winnebago County – Town of Black Wolf and Town of Nekimi

In addition, we have had numerous community detections in the previously quarantined counties. There are too many communities to list here, but you can check out the complete EAB detection list online at: <http://datcpservices.wisconsin.gov/eab/articleassets/ConfirmedEABFindsinWisconsin.pdf>. EAB has now been found in 19 of Wisconsin's 72 counties.

Communities and other local governments should consider treating high-value ash trees if within 15 miles of a known EAB detection. Odds are good that you will be able to keep a healthy ash tree alive and looking intact, even as adjacent, untreated ash decline and die. Information for communities can be found online at www.emeraldashborer.wi.gov. (Click For Communities tab.)

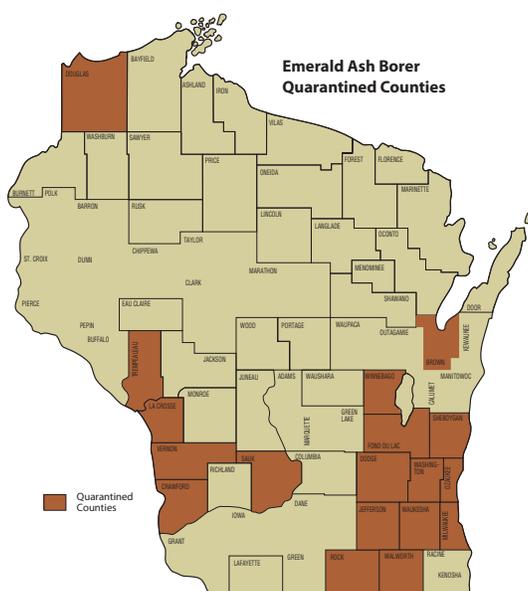
UW–Extension has revised its homeowner insecticide recommendations brochure, available online at: <http://hort.uwex.edu/sites/default/files/Homeowner%20Guide%20to%20EAB%20Insecticide%20Treatments%20May%202015,%202013.pdf>. There is also a companion guide, Is My Ash Tree Worth Treating for Emerald Ash Borer?, available online at <http://labs.russell.wisc.edu/eab/files/2012/12/Is-My-Ash-Tree-Worth-Treating-for-Emerald-Ash-Borer.pdf>.

For those local governments that own wooded areas where timber harvesting may occur, the new EAB detections have expanded the area where ash trees should silviculturally be considered High Risk trees. DNR silviculture guidelines currently recommend that ash trees in a quarantined county, or those outside a quarantined county but within 15 miles of a known EAB detection, be considered High Risk for forest management purposes. This would generally mean that salvage and pre-salvage timber harvests of ash trees would be conducted within this area because the ash trees are likely to be dead before the next scheduled timber harvest in 10–15 years. The silviculture guidelines are available online at <http://dnr.wi.gov/topic/ForestHealth/documents/EABWIManagementGuidelines.pdf>. The assistance of a forester is recommended when managing natural wooded areas.

EAB was found for the first time in a total of 90 counties nationwide during 2013. Four states—Colorado, Georgia, New Hampshire and North Carolina—had first state detections in 2013 and EAB has now been found in 22 states.

EAB Natural Enemy Introductions

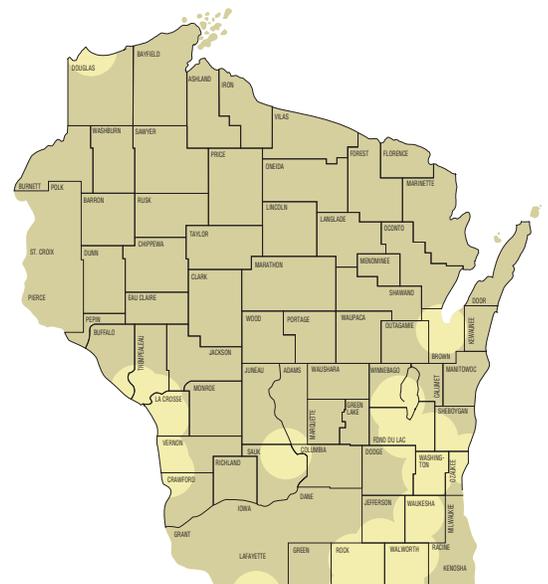
DNR staff did several introductions of the EAB natural enemy wasps, *Tetrastichus planipennis* and *Oobius agrili*, at three sites in southeast Wisconsin in the summer of 2013. The *Tetrastichus* wasps attack EAB larvae beneath the bark, and the *Oobius* wasps attack EAB eggs on the bark surface. The parasitoids



Left: EAB-quarantined counties as of January 2014

Right: Shaded areas are within 15 miles of a known EAB infestation as of February 2014.

Note: The 15-mile zone will constantly change as new EAB infestations are detected



were produced and supplied by the USDA EAB Parasitoid Rearing Facility in Brighton, Michigan. Previous releases were done in Ozaukee and Vernon Counties in 2011 and 2012. Recent surveys have found that the *Tetrastichus* wasps have successfully established at the 2011 Newburg release site (it is too early to do surveys at the other Wisconsin release sites).

These introductions are being done to help slow the spread and buildup of EAB populations, and to help delay tree mortality. Michigan studies are finding that about 20% of larvae and 20% of eggs have been attacked at the earliest release sites. In addition, the wasps will help to reduce EAB populations over the long term. The tiny wasps do not sting or bite, and the public is unlikely to know they are present. It is anticipated that the wasps will be introduced at additional sites in 2014.

Tetrastichus wasps are released in two ways — as adult wasps or as pupae inside small ash pieces that are nailed to ash trees. The wasps complete their development inside the small ash pieces and then chew their way out to attack EAB larvae in their new environment. *Oobius* wasps are introduced inside parasitized EAB eggs that are inside rain-protected plastic cups. The *Oobius* adults emerge inside the cups and fly away to attack EAB eggs in their new environment.

EAB Mortality Aerial Surveys

Aerial surveys of EAB mortality were conducted in southeast Wisconsin in late summer to monitor existing mortality pockets and to determine if new pockets had been formed due to heavy ash mortality. The surveys found that ash mortality continues to be heaviest in and around Newburg and Oak Creek. Our observations are consistent with the experiences of other states, who found that EAB mortality can increase very rapidly once trees start dying.

Woodpeckers Are Good EAB Detectors

EAB larvae beneath the bark are a good-sized meal for a woodpecker. In late winter, keep an eye out for signs of woodpecker activity on ash branches and tree trunks as the birds hunt for larvae. Woodpeckers pick away the rough outer bark over an EAB gallery and then drill down through it to get the EAB larva. Our experience is that the activity is most apparent during late winter.

Management of Ash Wood Waste

The Wisconsin EAB Program has produced a new EAB guide, “The Detailed Guide to Wisconsin’s Regulations on Transport, Utilization and Disposal of Ash Wood,” that replaces several outdated publications. It can be found online at <http://datcpservices.wisconsin.gov/eab/articleassets/Guide%20to%20WI%20ash%20wood%20transport%20utilization%20and%20disposal%20regs.pdf>.

The Wisconsin Dept. of Agriculture, Trade and Consumer Protection (DATCP) has clarified its policy on log transport out of an EAB-quarantined area. Ash logs are regulated by the EAB quarantine, but non-ash logs are not regulated and have no EAB quarantine restrictions.

- All non-ash timbers greater than 4 ft. in length that will be transported out of an EAB quarantine are considered logs for regulatory purposes, even if the eventual intended use may be split firewood. At that size, identification to species is relatively easy.
- Note that the gypsy moth quarantine throws a broader net, since all logs and firewood coming out of a gypsy moth quarantine area are regulated, regardless of species or firewood intentions.
- Note that all hardwood firewood is still regulated by the EAB quarantine.

You may have been wondering how the DNR Invasive Species Administrative Rule commonly known as NR40 will affect your community’s EAB management. You may be relieved to learn that wood that is potentially or likely infested with EAB can be moved within the boundaries of an area quarantined for EAB without violating NR 40 restrictions. The state and federal quarantines remain in effect, though, so they will apply for any movement of ash materials out of a quarantine area. Gypsy moth quarantines may also apply. For more information on requirements for wood leaving the quarantine, visit <http://emeraldashborer.wi.gov>.

EAB spreads slowly on its own and there are many communities and woodlands within the quarantine where this pest is not known to be present. If you have to take down dead or dying ash within the quarantined area, consider that the trees may be infested and thus pose a risk of introducing EAB into a new location. You can significantly reduce the risk of being the source of a new infestation by following the “Recommendations to Reduce the Spread of EAB in Potentially Infested Wood,” which are similar to best management practices. The recommendations can be found online at <http://datcpservices.wisconsin.gov/eab/articleassets/EAB%20Best%20Management%20Practices-BMP%20recommendations.pdf>.

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Tetrastichus wasp released to help fight EAB



EAB natural enemy release methods: ash pieces used to introduce *Tetrastichus* wasps and “oobinator” plastic cups used to introduce *Oobius* wasps



Woodpecker flecking on an EAB-infested tree in Fredonia (Ozaukee County), and EAB larval galleries beneath the bark

Photo: Bill McNeel, DNR Division of Forestry

Photo: Bill McNeel, DNR Division of Forestry

Photo: Bill McNeel, DNR Division of Forestry

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Community Tree Profile

American arborvitae, northern white-cedar, eastern white-cedar (*Thuja occidentalis*)

by Laura G. Jull
Dept. of Horticulture
University of Wisconsin-Madison

Native To: northeastern and midwestern U.S. and Canada south to the Appalachian Mountains of North Carolina and Tennessee

Mature Height: 40–60' (shrub cultivars do exist that are much smaller)

Spread: 10–20' (depends on cultivar)

Form: dense, broad pyramidal to narrow, conical with ascending branches; single or multi-stemmed

Growth Rate: slow to moderate

Foliage: evergreen, dark to bright green, scale-like leaves appressed to stem, only 1/8–1/4" long, imbricate, in pairs, flaring at tips and overlapping like fish scales; semi-glossy with a tiny resin duct on back of scale-like leaves that when rubbed, emits a very nice aroma similar to tansy; foliage arranged in soft, horizontal to vertical, flattened, fan-shaped sprays; species turns bronze to yellow-green in winter before turning dark green in spring; newer cultivars remain green during winter (see below under cultivars)

Buds and Stems: grayish brown, alternate, flattened branchlets; buds are very tiny growing from the tips

Fall Color: none, evergreen, but does turn bronze to yellow-green in winter

Cones: ovoid to globular, 1/3–1/2" long, yellowish then brown, upright at first, then pendulous when mature with 6–10 cone scales with rounded tips; cones resemble a small, wooden rose bud or a duck's bill and are persistent on the tree; 4–8 flattened, winged seeds are produced per cone

Bark: reddish brown to gray-brown, shreddy, fibrous

in long, narrow strips, often twisted in a long spiral around the trunk; interconnecting ridges and shallow furrows

Site Requirements: adaptable to most soils and pH, but grows best in rich, moist, loamy, well-drained soils; easy to transplant into landscape. It tolerates full sun to partial shade and is heat tolerant. In heavy shade, the tree will get thin and sparse. Arborvitae is tolerant to periodic flooding, but not constantly wet soil; likes high humidity.

Hardiness Zone: 3a–7b

Insect & Disease Problems: spider mites during dry summers, arborvitae leaf miner, scale, bagworm (more of a problem in southern regions), root rot, and heart rot

Suggested Applications: Arborvitae is a widely used landscape plant found as a lawn or park tree, specimen plant (particularly the gold foliage cultivars) or planted in masses to screen views or to provide a windbreak. Dwarf shrub cultivars are often used in foundation plantings, shrub borders, or sheared into a formal hedge.

Limitations: Intolerant to road salt, susceptible to snow, ice and wind damage as branches break easily due to weight of snow and ice; very susceptible to deer browsing making the plant unsightly until foliage grows back, which can take years. Some shrub forms tend to open up in the center with age and after heavy snowfall. Species turns brown to yellow-green in winter, therefore, select cultivars known to maintain dark green color through winter.

Comments: Many cultivars to choose from including dwarf shrubs, columnar, tall shrubs, tree forms, variegated or yellow foliage plants. Newer selections have superior dark green winter color and better form compared to species. The wood is rot resistant and is used in making fence posts, sheds, shingles, canoes and particle boards. The leaves were used in Native American medicine to suppress coughs and fevers. Tea made from the leaves of arbovitae is high in vitamin C and has been used to treat scurvy. The Latin common name "arborvitae" means "tree of life."

Common Cultivars or Selections: Over 100 commercially available, see references on page 9.

Continued on page 9



Photo: Ed Hasselkus, UW-Arboretum
Thuja occidentalis



Photo: Ed Hasselkus, UW-Arboretum
Thuja occidentalis



Coming Events

May 15, 2014 – *Illinois Invasive Species Awareness Month Workshop*, Lisle, IL; www.mortonarb.org/courses/3rd-annual-isam-workshop.

June 3–5, 2014 – *2014 Smallwood Conference*, Rochester, MN; www.forestbusinessnetwork.com/our-events/2014-smallwood/.

June 19–20, 2014 – *Soils & Urban Trees Conference*, Asheville, NC; www.ufis.ca/soil2014.php.

August 2–6, 2014 – *International Society of Arboriculture International Conference & Trade Show*, Milwaukee, WI; www.isa-arbor.com/events/eventsCalendar/index.aspx.

Urban Forest Insect Pests

Flatheaded Appletree Borer

by Linda Williams,
Forest Health Specialist
DNR Division of Forestry

Flatheaded appletree borer (*Chrysobothris femorata*) is a native buprestid borer. Hosts include apple, beech, elm, linden, maple, oak and other hardwoods, but most recently, with the interest in monitoring ash trees for emerald ash borer, we have been noticing a lot of flatheaded appletree borer attacking ash.

Adult beetles, which are about ½ inch long, emerge in late spring, leaving an oval exit hole in the bark. Eggs are laid and the larvae hatch and bore under the bark of the trees to begin feeding in the cambium layer. The larvae, white legless creatures with a head larger than the body, will feed for a year before boring deeper into the wood to pupate. The galleries of flatheaded appletree borer are often less distinct when compared to the serpentine gallery of an EAB, with flatheaded appletree borer



Flatheaded appletree larvae with winding galleries

Photo: Tom Flick

galleries looking more like a blob of feeding rather than a nice clear tunnel.

As a native borer they prefer to attack trees that are under stress, or to attack trees at stress points such as branch unions or poor pruning wounds. Young trees, recent transplants, poorly planted trees or trees under environmental stress such as drought or flooding can also be very attractive to flat-headed appletree borer. Additionally, I have found them heavily infesting ash trees in areas where EAB populations are still low but are beginning to stress the trees. They can cause branch mortality if they are attacking a branch or at a branch union, or they can be found attacking the trunk and can cause whole tree decline and mortality.

Control options include pesticides, natural enemies and maintaining tree health. Chemical controls can target the adults if large numbers of adults are noted, or systemic insecticides can be used to target the larvae. There are at least 12 species of parasitic wasps that attack flatheaded appletree borer. Woodpeckers are also a good biological control agent as well as a handy external indicator that something is wrong with your tree. But keeping your trees as healthy as possible is your best control option. Healthy trees will not be attractive to flatheaded appletree borer. Measures to minimize stress, including proper planting, proper pruning, and watering during drought, will help keep this native pest away from your trees. 🌿

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Flatheaded appletree borer larva

Photo: Tom Vanden Elzen

Community Tree Profile, continued from page 8

References:

A Handbook of the World's Conifers, Vol. 2, 2010, by A. Farjon, Brill Academic Publishers, Leiden, The Netherlands.

Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses, 6th ed. 2009, by M. A. Dirr, Stipes Publishing, Champaign, IL.

Native Trees, Shrubs, and Vines for Urban and Rural America: A Planting Design Manual for Environmental Designers, 1988, by G.L. Hightshoe, John Wiley and Sons, Inc., New York

North American Landscape Trees, 1996, by A. L. Jacobson, Ten Speed Press, Berkeley, CA.

Trees of the Central Hardwood Forests of North America: An Identification and Cultivation Guide, 1998, by D.J. Leopold, W.C. McComb, and R. N. Muller, Timber Press, Portland, OR. 🌿

August 14, 2014 – Wisconsin Nursery Association Summer Field Day & Trade Show, Sturgeon Bay, WI; www.wgjif.net/events.aspx.

August 17–20, 2014 – American Public Works Association Congress, Toronto, Ontario, Canada; www.apwa.net/Congress.

November 4–7, 2014 – Wisconsin Park & Recreation Association Annual Conference and Trade Show, Wisconsin Dells, WI; www.wpraweb.org/.

November 5–6, 2014 – Partners in Community Forestry National Conference, Charlotte, NC; link to program/registration info not yet available

January 14–16, 2015 – Northern Green Expo, Minneapolis, MN; <http://northerngreenexpo.org/index.asp>. 🌿

If there is a meeting, conference, workshop or other event you would like listed here, please contact Cindy Casey. Please see back cover for contact information.

Gravel Planting Beds, continued from page 2

The PVC pipe was cut and glued to allow the irrigation heads to be spaced every 10 feet and 2 feet off the ground. The pipe and irrigation heads were then attached to the sides of the metal pole building. Winterizing the system will be very easy. Simply removing the garden hose should allow most of the water to drain out. However, a 90-degree elbow with a plug was added at the end of the line to allow for complete drainage and the ability to blow air through the line if needed.

Costs and Benefits

For Rothschild the benefits were greater than the costs. Since the village had the location and the excess material, the only real cost was the construction time and the cost of irrigation materials. The amount of time it took to place the trees into the beds, initial construction and construction of the irrigation system equaled 20 man hours. Materials for the irrigation system totaled less than \$150. The village was able to purchase additional bare root trees and extend the planting season, as these trees were first placed in the bed on May 8, 2013. Since the trees did so well in the MGB, the village extended the planting season for one tree on a special project. That tree was planted the first week of August, thus an approximate three-month holding period, with no decline or mortality. In fact, some trees grew approximately two feet during that time frame.

The Future

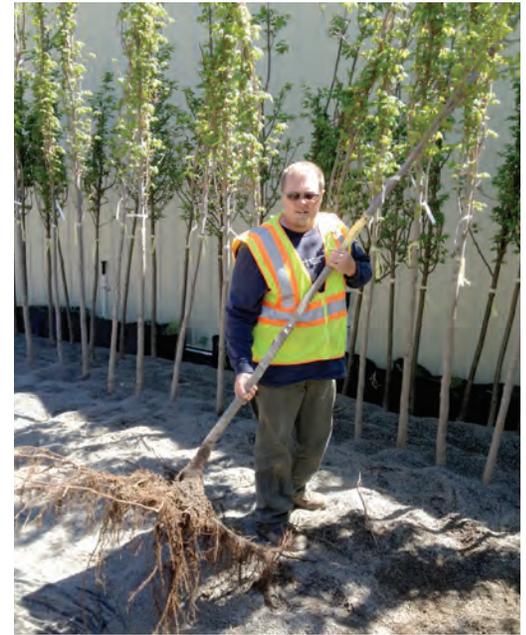
The Village of Rothschild’s MGB worked very well. It allowed the village to stretch its planting season, money and resources over a longer period of time. There do not appear to be any major changes needed for next year. The only minor change that may occur is the use of landscape fabric instead of plastic to line the bottom of the gravel bed. The village envisions using their MGB for many years to come.

For more information about Rothschild’s MGB, please contact Village Forester Rex Zemke, 715-302-0660 or rzemke@rothschildwi.com.



Trees in holding yard

Photo: Village of Rothschild



Ready for planting

Photo: Village of Rothschild

What Damaged This Tree?

Turn to page 15 to find out...



Photo: Rebecca Lane, City of Oak Creek, Division of Forestry

DNR Awards 46 Urban Forestry Grants 2014

by Olivia Shanahan, Urban Forestry Grant Specialist
DNR Division of Forestry

The DNR Urban Forestry Grant program awarded \$602,486 to 46 Wisconsin communities, nonprofit organizations and counties for community urban forestry projects. Grant funds for 2014 will support tree inventories and assessments, management plans, emerald ash borer (EAB) preparedness plans, urban forest restoration projects, staff training, public education and other urban forestry efforts.

Communities were encouraged to apply for grants to bolster their preparedness for EAB. Wisconsin has approximately 5.2 million ash trees in cities, villages and urban towns. All are at a heightened risk since EAB was confirmed in Wisconsin in 2008. The grant awards

will help communities conduct tree inventories, develop EAB preparedness plans or increase species diversity, all of which are critical to early planning efforts that include forecasting budgets for labor, equipment, staff training and restoration.

The program also encourages applicants to consider a canopy approach to their urban forestry projects, directing efforts to both public and private trees.

Grants can range from \$1,000 to \$25,000 and grant recipients must match each grant dollar for dollar. Further information about the Urban Forestry Grant program is available on the DNR Urban Forestry Web page at: dnr.wi.gov keyword: UF grant.

This list of 2014 DNR Urban Forestry Grant recipients and other helpful resources are also available on the Web page. (*Startup Grants for new or restarted urban forestry programs, \$5,000 maximum) 🌿

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2015 Urban Forestry Grant applications are due October 1, 2014.

Visit dnr.wi.gov, keywords UF Grant

Recipients of 2014 DNR Urban Forestry Grants

City of Appleton \$25,000

Tree Inventory and Staff Training

City of Baraboo \$19,086

EAB Treatment, Removal & Tree Inventory Update

Village of Bayside \$25,000

Tree Inventory Update, Removal & Planting

***Village of Belgium \$5,000**

Tree Maintenance, Pruning, Planting

***City of Brillion \$5,000**

Brillion Parks Tree Planting and Pruning

Village of Brown Deer \$25,000

2014 EAB Survey, Treatment & Removal

City of Burlington \$25,000

Emerald Ash Borer Pest Control

Village of Clinton \$8,675

2014 Forestry Project

Community Ground Works \$25,000

Building an Urban Forestry Community Engagement Model

Village of Deerfield \$6,790

EAB Management & Training and Educating the Community about EAB

Village of DeForest \$25,000

Downtown Stormwater and Street Tree Improvements & Community Garden Orchard

City of Fitchburg \$19,578

Fitchburg EAB Implementation and Urban Forestry Plan Revision

Village of Fox Point \$15,000

Re-Inventory of all Public Trees in GIS

City of Fond du Lac \$5,409

Staff Education and Urban Tree Treatment and Planting

***City of Fort Atkinson \$5,000**

City of Fort Atkinson Tree Inventory

Town of Greenville \$11,059

Canopy for Greenville Ordinance Education Pruning

***City of Hillsboro \$4,000**

Hillsboro Urban Forestry Plan Implementation Phase 1

***Village of Hortonville \$5,000**

Forestry Program Startup

City of Hudson \$18,651

2014 City of Hudson Reforestation, Tree Diversity & EAB Public Awareness

***Village of Kronenwetter \$5,000**

Kronenwetter Urban Forestry Program

City of Milwaukee \$25,000

Assessing Milwaukee's Urban Tree Canopy Cover, Composition & Benefits

City of New Berlin \$11,261

Inventory and EAB Management Plan

Northeastern Wisconsin Master Gardeners, Inc. \$1,200

Allouez Against Emerald Ash Borer

Ozaukee Co., Planning & Parks Dept. \$24,000

Improvements to Local Ecology at Ozaukee County Parks

Ozaukee Washington Land Trust \$19,327

OWLT Forest Inventory and EAB Response

***City of Peshtigo \$5,000**

2014 Urban Forestry Tree Planting, Pruning, and Removal Project

***City of Pittsville \$2,500**

City Tree Maintenance

City of Prairie du Chien \$10,484

Outdoor Forestry Classroom and Education

***City of Prescott \$2,500**

Tree Inventory, Management Plan and Public Outreach

City of Reedsburg \$17,000

Reedsburg Tree Inventory

Robert W. Monk Gardens, Inc. \$25,000

Creating a Garden Classroom for Canopy Development

Village of Shorewood Hills \$4,929

EAB Plan, Public Awareness and Education, Training, and Implementation

Southwest Badger RC&D \$25,000

Emerald Ash Borer Municipal Outreach, Education and Tree Risk Survey

City of Stevens Point \$12,973

Staff Training and Public Awareness

Sustainable Atwood \$25,000

Madison Urban Wood Model Development and Marketing of Online Urban Wood Marketplace

Village of Thiensville \$1,275

Urban Forest and EAB Education and Ordinance Revision

***City of Tomah \$2,000**

City of Tomah's Tree Planting and Public Outreach

City of Tomahawk \$10,000

City Inventory and EAB Plan

Town and Country RC&D \$21,286

From Waste to Resource Management; Maximizing EAB Affected Urban Forest Resources

***Town of Turtle \$4,000**

Town of Turtle Tree Inventory, Management and Removal Plan

Urban Tree Alliance \$25,000

Madison Area Canopy Project

City of Waukesha \$7,368

EAB Management Parks Tree Inventory

City of Wauwatosa \$3,117

Tree Risk Assessment Qualification

Winnebago County \$14,570

Enhancing the Urban Forests of Winnebago County

Village of Winneconne \$5,673

2014 Urban Forest Right of Way Partnership

Zoological Society of Milwaukee County \$13,772

Emerald Ash Borer 2014 Action Plan

**Start-up grant*

Hudson and its Trees, continued from page 2

ticularly as it pertains to ash trees, prompted the city to adopt an emerald ash borer readiness plan.

While the ash borer has yet to be found in Hudson, it is approaching the area both from the east and from Minnesota. The readiness plan includes recommendations on preventive chemical treatments for healthy trees and information about the costs and other resources needed to address management of the ash borer once it arrives. Proactive measures suggested in the plan allow the costs to be spread out over a period of time and to minimize the impact of EAB.

But the EAB readiness plan is just part of Hudson's Urban Forestry Plan. The city sustained significant tree loss and damage from serious storms in the early summer of 2013. Some 87 trees were lost in the city's nine parks and along boulevards. The inventory and satellite images from the report helped public works and park staff analyze the damage and assess the impact on the city's forest.

In addition, the Urban Forestry Board is working in conjunction with the City of Hudson Common Council to adopt a new city ordinance regarding the planting of trees on city boulevards. "The idea is to provide residents with guidelines they can use for planting trees that provide diverse species, are well suited to the soil and environment and that won't grow too large and interfere with power lines," said Zeuli.

The board also hopes that residents will use the guidelines and consult those who are familiar with city's urban forestry program when they consider trees to plant on their own property.

The Hudson Urban Forestry Board has developed productive partnerships with a variety of groups and organizations throughout the Hudson area.

In cooperation with the Hudson School District and Sustain Hudson, a new school forest was established at the middle school with an outdoor learning shelter. There are plans to improve other existing school forests and ensure that every school in the district has its own forest, with some discussion of establishing school orchards. The board is also working with sustainability groups at both Hudson High School and Hudson Middle School.

Volunteers from Hudson's Rotary clubs have assisted in a number of projects including trail maintenance and buckthorn removal. Downtown businesses have participated in Arbor Day celebrations and made donations to the city's tree budget.

There are also eight residents from Hudson being trained as Forest Pest First Detectors, a Minnesota initiative that trains volunteers on how to identify and diagnose the presence of EAB and other invasive pests.

Despite a small planting budget and workforce of only eight public works and parks employees, the City of Hudson, the Urban Forestry Board and some dedicated volunteers have taken the important first steps to ensure that Hudson will honor its past and remain a Tree City USA for generations to come.

For more information about Hudson go to www.ci.hudson.wi.us/. For more information about the city's urban forestry program contact Tom Zeuli, Public Works and Parks Director, 715-386-4767, ext. 114, or tomzeuli@ci.hudson.wi.us.

2014 ISA Annual Conference and Trade Show—Milwaukee

Events

The [ISA Annual Conference and Trade Show](#) returns to Milwaukee August 2-6, 2014. Hotels, tours, programs... everything you want to know about the conference is on the ISA website. Information will be posted as it becomes available.

The STIHL Tour des Trees will take place July 27-August 2nd. There are many ways to participate in this benefit ride for tree research (TREE Fund). For more information please check the [STIHL Tour des Trees website](#).

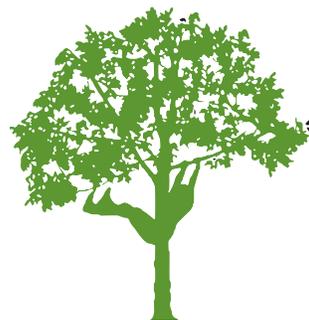
The International Tree Climbing Competition (ITCC) will be held Saturday August 2, 2014 at Mount Mary University. The Master's Challenge will take place on Sunday the 3rd at the same location. A significant number of volunteers are needed for a number of jobs tasks. Please contact Gary Kohler at jkohler@wi.rr.com for more information regarding the ITCC.

Volunteering

To volunteer your time, skills and talents you may register your contact information by using this link: <http://bit.ly/2014MKE>. You will be contacted as the event gets closer or as information becomes available.

If you're interested in stepping up to take on a more active leadership role or coordinator position on the 2014 Conference Committee, please contact Dave Graham directly at (608) 751-0012.

This is a giant group effort that will reward volunteers with lots of fun and great memories, guaranteed! 🌿



Urban Forestry Council Awards Announced

by Laura Wyatt, Urban Forestry Council Liaison
DNR Division of Forestry

The **Wisconsin Urban Forestry Council** is pleased to announce the recipients of its **2013 Urban Forestry Awards!** Winners were recognized at the awards luncheon at the WAA/DNR annual urban forestry conference and will receive plaques at upcoming formal presentations in their own communities.

Distinguished Service— Laura DeGoller

This year's winner is recognized for volunteer work and leadership in maintaining Fond du Lac's Greenway Arboretum, including its hundreds of trees; for recruiting and coordinating volunteers; and for serving as a tireless advocate for natural resources, including invasive species removal, water sampling, landscape and trail maintenance, and spearheading the city's efforts to become a Wisconsin Bird City.



Laura monitoring stream

Photo: Laura DeGoller

Project Partnership—Sparta High School Earth Club, partnering with Century Foods International of Sparta, the City of Sparta, Polar Bears International and Milwaukee County Zoo

This long-term partnership involved the award winning programs "Trees for You and Me" and "Tree Planting for Climate Change," which have resulted in a healthier and more diverse urban forest in the city of Sparta.



Sparta High School Earth Club members with local celebrities.

Photo: Pat Murphy, DNR Division of Forestry

Project Partnership—City of Menasha and CN 30 for 30 Partnership Project

This partnership between the City of Menasha and CN (Canadian National Railroad) formed in celebration of the city's 30 years as a Tree City USA. Numerous volunteer groups teamed up to improve the long-term health and diversity of the urban forest by planting 30 trees in each aldermanic district. Over 100 volunteers planted 240 trees.

Innovations in Urban Forestry—Bob Wesp, Dwayne Sperber and City of Milwaukee

This award recognizes the development of a working model which processes and markets Milwaukee's urban wood. The results include less wood going into landfills, reduced cost to taxpayers and a higher level of use of Milwaukee's urban wood resources.



Re-purposed ash in Clock Shadow Building, Milwaukee

Photo: Any Hill Photography

Innovations in Urban Forestry—Mequon Nature Preserve and City of Mequon

This award recognizes a reforestation program involving thousands of trees, invasive species removal, establishing new walking trails and developing an environmental science program. Project goals include restoring forest canopy and increasing biodiversity of an urban forest serving over a million people living throughout the metropolitan Milwaukee area.

Lifetime Achievement—Todd Ernster

This year's winner is recognized for 25 years of service to the City of Stevens Point, most recently as city forester. Todd worked his way up through the ranks from arborist after graduating from UW—Stevens Point. He has maintained a fine tradition of Tree City USA accomplishments. He authored the city's specifications for protecting trees during construction and he actively promotes public awareness of urban trees via brochures, a signage program on city buses, website information, and regular outreach to newspapers, the park board and common council. Todd has supported his profession by serving on the WAA program committee, and by assisting DNR with the Community Tree Management Institute and student mentoring.



Todd and Stevens Point community celebrating 30 years as Tree City USA

Photo: City of Stevens Point

Deadline for nominations is **December 30**, although nominations can be submitted at any time.

Wisconsin Urban Forestry Council Awards are presented in five categories:

- ***Lifetime Achievement**, for outstanding contributions to Wisconsin urban forestry made throughout a lifetime career
- ***Distinguished Service**, recognizing an individual for significant urban forestry contributions
- ***Project Partnership**, for projects that utilize partnerships as a means of providing service or benefits to the urban forest
- ***Elected Official**, recognizing a state, county or local official who has made a recent contribution to urban forestry in Wisconsin
- ***Innovations in Urban Forestry**, recognizing a community, individual, association or organization that has exhibited innovation (creativity, commitment and success) in the development or enhancement of an urban forestry project or program. This award recognizes the creativity, commitment and success of urban forestry efforts. 🌿

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To submit a nomination visit <http://dnr.wi.gov/topic/UrbanForests/awards.html>.



Does your community or organization have an idea, project or information that may be beneficial to others? Please let your regional urban forestry coordinator know. We will print as many of these as we can.

The Idea Exchange

compiled by Olivia Witthun
DNR Division of Forestry

Expanded Work Force for EAB Treatments

The City of Port Washington partnered with Portal, a local non-profit, to apply EAB treatments to city ash trees. Portal is dedicated to advancing employment and meaningful community life opportunities for people with developmental disabilities in Ozaukee County. One person from Portal was matched up with the job requirements and worked with the city arborist until all the ash trees were treated. Together they treated 588 ash trees—soil injections of imidacloprid on trees under 10" diameter, trunk injections with TREE-äge on trees over 10". Two hundred fifty-six man hours were spent applying treatments; 108 of these hours were provided at no cost by the Portal employee. The cost of treatment averaged \$40 per tree. Through this partnership, Port Washington was able to treat 588 ash trees for EAB and the Portal employee was able to gain new life experiences, meet new people and develop life skills for quality living. Info: www.portalinc.org/ and Rob Vanden Noven, City of Port Washington Engineer, 262-268-4267, rvandennoven@ci.port-washington.wi.us.



The Tree Story Project

The Tree Story Project is an ongoing initiative to gather personal stories relating to trees. Climbing trees, building tree forts and playing in the woods are many people's fondest memories. This project provides an opportunity to sit down and reminisce with friends and family, connecting people to one another while paying homage to the trees in their lives. It is hoped the stories inspire everyone to plant more trees in their community. The first phase of this project was completed in December 2012 with the creation of the Tree Story Project booklet which contains 34 stories. Then a blog was created to collect and share more stories. Other planned phases include collecting and publishing stories of school-age children along with the broadening of media to include photographs and artwork. This project came to fruition through a partnership between the Northeast Wisconsin Master Gardeners, Green Bay Botanical Garden and Brown County Extension and was funded in part by a WDNR Urban Forestry Grant. Perhaps you'd like to submit your own tree story or create something similar on a community-level scale. Info: <http://treestoryproject.wordpress.com/>



Visual Simulation Software

The National Agroforestry Center has developed CanVis, a free image-editing program developed specifically for creating natural resource planning simulations. CanVis is an easy-to-use program and powerful visualization tool that can help your community market tree plantings and other revitalization projects. Urban foresters and planners can use the software to show the impact of tree planting on a street.

How it works: First download the free software. Then upload a photo of the area you want to visualize. For a downtown revitalization project, for example, select trees to plant from the library. Other infrastructure is available too—benches, streetlights, flowers, hanging baskets, shrubs, people and more. Simply drag and drop objects onto the photo and resize as necessary. You can add shadows or adjust angles and colors to make the image more realistic. The image can be saved in many file formats. These visuals are powerful tools when presented to the public, select boards, city council and other partners. Info: <http://nac.unl.edu/simulation/index.htm>



Urban & Community Forestry Program Resources

Urban Trees & Stormwater
compiled by Cindy Casey,
Urban Forestry Coordinator
DNR Division of Forestry

Stormwater to Street Trees: Engineering Urban Forests for Stormwater Management

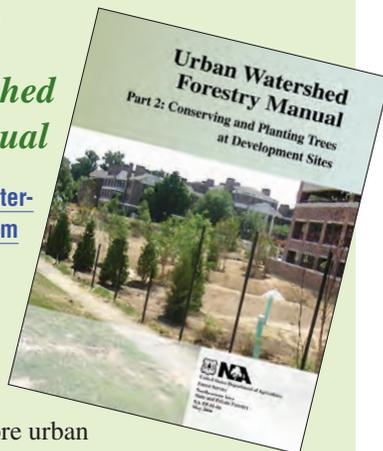
www.davey.com/media/183712/Stormwater_to_Street_Trees.pdf

A new guide by the US Environmental Protection Agency to help engineers, planners, developers, architects, arborists and public officials understand how trees perform and interact in a stormwater management system, and new technologies being used to increase effectiveness of grey & green stormwater systems

Urban Watershed Forestry Manual

<http://na.fs.fed.us/watershed/publications.shtm>

3-part manual by Center for Watershed Protection and US Forest Service about using trees to protect and restore urban watersheds, available for download in pdf format



US Forest Service Pacific Southwest Research Station, Urban Ecosystems & Processes: Water

www.fs.fed.us/psw/programs/uesd/uep/research/water.shtml

A list of references specific to the influence of urban forests on stormwater runoff

Photo: Rebecca Lane, City of Oak Creek



What Damaged This Tree?

Answer: Construction!

Construction activity near trees can result in compound damage that leads to tree stress, decline and death. In this photo, construction damage includes broken and injured limbs, root excavation and soil compaction within the rooting zone.

Broken, ripped or injured limbs leave the tree vulnerable to decay and other pest problems. Proper pruning is based on tree biology to minimize injury and promote effective wound closure. For more about proper tree pruning see dnr.wi.gov, keyword: Tree Pruning Brochure.

Most tree roots are located in the upper 6–12 inches of soil and can extend outward from the trunk up to three times the height of the tree. It's *very* easy to damage roots during construction. Excavating or severing roots can compromise tree stability and increase risk of toppling. Crushed or torn roots are vulnerable to decay. Heavy equipment used near trees can compact the soil, reducing pore space necessary for proper root aeration and moisture. Water infiltration and drainage can also be severely restricted in compacted soil. For more about soil compaction and trees see www.uwsp.edu/cnr-ap/leaf/Pages/Soil-Compaction.aspx.

Construction-related damage to trees often results in a slow decline over several years. The various compounding factors are often irreversible, but are often preventable. Consultants are available to lend expertise before, during and after construction projects. For more about avoiding tree damage during construction see www.treesaregood.com/treecare/avoiding_construction.aspx.



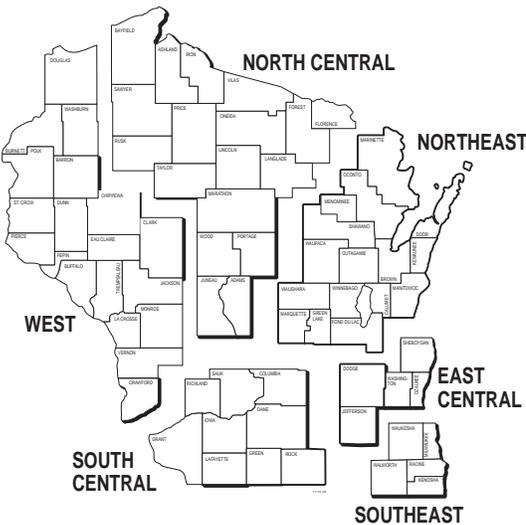


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